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METHODS OF FOLDING DISPOSABLE ABSORBENT ARTICLES

by

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FOLDING OF A DISPOSABLE ABSORBENT ARTICLE

REFERENCE TO PRIOR APPLICATION

This is a continuation-in-part of U.S. Patent Application No. 10/366,872, filed February 14, 2003, herby incorporated herein by reference.

BACKGROUND

The present invention relates to methods of folding. More particularly, the present invention relates to methods of folding disposable absorbent articles, the methods resulting in folded disposable absorbent articles that are relatively compact.

Absorbent articles such as, for example, diapers, training pants and adult incontinence garments are generally available to users in packages which include multiple articles therein. Frequently, these users often encounter situations away from home which would be satisfied with a single disposable absorbent article. Users therefore often carry single disposable absorbent articles about in purses, backpacks, briefcases and other similar containers until needed. Unfortunately, these containers do not always provide a hygienic environment for the disposable absorbent articles, and thus the articles can become dirty and/or damaged. Another situation arises when users are away from home and forget to pack even a single disposable absorbent article. These users typically have no alternative but to purchase multiple disposable absorbent articles in a single package.

In view of the foregoing, the manufacturers of disposable absorbent articles have attempted to enclose a smaller number of disposable absorbent articles in relatively compact packaging. Many of these attempts do not address reducing the configuration or footprint of the disposable absorbent articles, but are instead limited to reducing only the number of disposable absorbent articles in a single package. Consequently, there remains a need to reduce the configuration or footprint of individual disposable absorbent articles.

SUMMARY

The present inventors undertook intensive research and development efforts concerning reducing the configuration or footprint of individual disposable absorbent articles. While conducting their research, the present inventors discovered unique methods of folding disposable absorbent articles that resulted in folded disposable articles that are more compact and thus well suited for enclosing in compact packaging. One version of the present invention involves a disposable absorbent article having an initial upper surface, an initial lower surface, a longitudinal centerline, a transverse centerline, opposing first longitudinal side edges, opposing first transverse end edges and an unfolded configuration. The article is folded by forming one fold extending in a transverse direction by bringing a portion of the

initial upper surface into facing relationship with another portion of the initial upper surface. The one fold so formed is spaced between opposing first transverse end edges. The resulting partially-folded article has an intermediate first surface, an intermediate second surface and opposing second transverse end edges. Thereafter, a number, greater than one, of transversely extending folds are formed in an accordion-like manner. The transversely extending accordion-like folds are spaced between opposing second transverse end edges.

Another version of the present invention relates to a disposable absorbent article having an initial upper surface, an initial lower surface, a longitudinal centerline, a transverse centerline, opposing first longitudinal side edges, opposing first transverse end edges, side margins, opposing terminal side edges and an unfolded configuration. The article is folded by forming at least one longitudinally extending fold in each side margin by folding each first longitudinal side edge inward toward the initial upper surface and thus bringing at least a portion of the initial upper surface into facing relationship with another portion of the initial upper surface. One fold is then formed extending in a transverse direction by bringing a portion of the initial upper surface into a facing relationship with another portion of the initial upper surface. The one fold so formed is spaced between opposing first transverse end edges. The resulting partially-folded article has an intermediate first surface, an intermediate second surface and opposing second transverse end edges. Thereafter, a number, greater than one, of transversely extending folds are formed in an accordion-like manner. The transversely extending accordion-like folds are spaced between opposing second transverse end edges.

Yet another version of the present invention involves a disposable absorbent article having an initial upper surface, an initial lower surface, a longitudinal centerline, a transverse centerline, opposing first longitudinal side edges, opposing first transverse end edges and an unfolded configuration. The article is folded by forming a number, greater than two, of transversely extending folds in an accordion-like manner. The transversely extending accordion-like folds are spaced between opposing first transverse end edges.

Still another version of the present invention relates to a disposable absorbent article having an initial upper surface, an initial lower surface, a longitudinal centerline, a transverse centerline, opposing first longitudinal side edges, opposing first transverse end edges, side margins, opposing terminal side edges and an unfolded configuration. The article is folded by forming at least one longitudinally extending fold in each side margin by folding each first longitudinal side edge inward toward the initial upper surface and thus bringing at least a portion of the initial upper surface into facing relationship with another portion of the initial upper surface. The article is then folded by forming a number, greater than two, of transversely extending folds in an accordion-like manner. The transversely extending accordion-like folds are spaced between opposing first transverse end edges.

Also disclosed is a disposable absorbent article having a relatively compact configuration. The disposable absorbent article has a topsheet, a backsheet and an absorbent core situated between the topsheet and the backsheet. The article has a folded configuration and an unfolded configuration. The article in its unfolded configuration has an initial upper surface, an initial lower surface, a longitudinal centerline, a transverse centerline, opposing first longitudinal side edges and opposing first transverse end edges. The article also has a ratio between its folded configuration and its unfolded configuration of no more than 0.15.

DRAWINGS

The foregoing and other features, aspects and advantages of the present invention will become better understood with regard to the following description, appended claims and accompanying drawings where:

FIG. 1 illustrates a plan view of a disposable absorbent article in an unfolded, flat-out, uncontracted state (*i.e.*, with all elastic induced gathering and contraction removed), with the bodyfacing surface of the article facing the viewer and with portions of the article partially cut away to illustrate underlying features;

FIG. 2 illustrates a plan view of a disposable absorbent article in an unfolded, flat-out, uncontracted state, with the garment facing surface of the article facing the viewer and with portions of the article partially cut away to illustrate underlying features;

FIG. 3 illustrates a plan view of a disposable absorbent article in an unfolded, flat-out, uncontracted state, with the bodyfacing surface of the article facing the viewer;

FIG. 4 illustrates a plan view of a disposable absorbent article with the first longitudinal side edges being folded in toward the longitudinal centerline;

FIG. 5 illustrates a plan view of a disposable absorbent article in an unfolded, flat-out, uncontracted stated, with the bodyfacing surface of the article facing the viewer;

FIG. 6 illustrates a side view of the disposable absorbent article of FIG. 5, when viewed from a transverse end edge;

FIG. 7 illustrates a perspective view of a partially-folded disposable absorbent article;

FIG. 8 illustrates a side view of a partially-folded disposable absorbent article;

FIG. 9 illustrates a top plan view of an intermediate first surface of a partially-folded disposable absorbent article;

FIG. 10 illustrates a further folding of a partially-folded disposable absorbent article;

FIG. 11 illustrates a disposable absorbent article having a number of folds in an accordion-like manner;

FIG. 12 illustrates the disposable absorbent article of FIG. 10 in a folded configuration;

FIG. 13 illustrates the disposable absorbent article of FIG. 10 in a folded configuration;

FIG. 14 illustrates a top plan view of an outer panel of a folded disposable absorbent article;

FIG. 15 illustrates a folding of a disposable absorbent article;

FIG. 16 illustrates the disposable absorbent article of FIG. 15 in a folded configuration; and

FIG. 17 illustrates the disposable absorbent article of FIG. 15 in a folded configuration.

DESCRIPTION

The present invention relates to methods of folding disposable absorbent articles. While the various versions of the present invention are described in terms of a disposable absorbent article such as an infant diaper, the invention is equally applicable to other disposable absorbent articles such as children's training pants, adult incontinence garments and the like.

Referring now to the drawings, FIG. 1 illustrates a disposable absorbent article such as a disposable diaper (30) in an unfolded, flat-out, uncontracted state (*i.e.*, with all elastic induced gathering and contraction removed). Portions of the structure are partially cut away to more clearly show the interior construction of the diaper (30), with the surface of the diaper which contacts the wearer facing the viewer. FIGs. 1 and 2 illustrate a disposable diaper (30) as having a front portion (32), a rear portion (34) and a crotch portion (36) located between the front and rear portions. The diaper (30) includes a backsheet (38), a topsheet (40), and an absorbent core (42) situated between the backsheet and the topsheet. The outer edges of the diaper (30) define a periphery (44) with transversely opposed, longitudinally extending first side edges (46); longitudinally opposed, transversely extending first end edges (48); and a system of elastomeric gathering members, such as a system including leg elastics (50) and waist elastics (52). The longitudinal side edges (46) define the leg openings (54) for the diaper (30), and optionally, are curvilinear and contoured. The first transverse end edges (48) are illustrated as straight, but optionally, may be curvilinear. The diaper (30) may also include additional components to assist in the acquisition, distribution and storage of bodily waste. For example, the diaper (30) may include a transport layer, such as described in U.S. Patent No. 4,798,603, issued to Meyer *et al.* (attorney docket number 8,263), or a surge management layer, such as described in European Patent Application Publication No. 0 539 703 (attorney docket number 9,922), published May 5, 1993.

With regard to the designated surfaces of a disposable absorbent article and its components, the various upper or bodyfacing surfaces are configured to face toward the body

of the wearer when the absorbent article is worn by the wearer for ordinary use. The various opposing or lower surfaces are configured to face away from the wearer's body when the absorbent article is worn by the wearer.

The diaper (30) generally defines a longitudinally extending length dimension (56), and a laterally extending width dimension (58), as representatively illustrated in FIG. 1. The diaper may have any desired shape, such as rectangular, I-shaped, a generally hourglass shape, or a T-shape.

The backsheet (38) defines a length and a width which, in the illustrated version, coincide with the length and width of the diaper (30). The absorbent core (42) generally defines a length and width which are less than the length and width of the backsheet (38), respectively. Thus, marginal portions of the diaper (30), such as marginal sections of the backsheet (38), may extend past the transversely opposed, longitudinally extending terminal side edges (60) and/or the longitudinally opposed, transversely extending terminal end edges (62) of the absorbent core (42) to form side margins (64) and end margins (66) of the diaper. The topsheet (40) is generally coextensive with the backsheet (38), but may optionally cover an area which is larger or smaller than the area of the backsheet, as desired. The backsheet (38) and topsheet (40) are intended to face the garment and body of the wearer, respectively, while in use. As used herein when describing the topsheet (40) in relation to the backsheet (38) and vice versa, the term "associated" encompasses configurations in which the topsheet is directly joined to the backsheet, and configurations where the topsheet is indirectly joined to the backsheet by affixing portions of the topsheet to intermediate members which in turn are affixed to at least portions of the backsheet. The topsheet (40) and the backsheet (38) can, for example, be joined to each other in at least a portion of the diaper periphery (44) by attachment mechanisms (not shown) such as adhesive bonds, sonic bonds, thermal bonds, pinning, stitching, or a variety of other attachment techniques known in the art, as well as combinations thereof.

The topsheet (40) suitably presents a bodyfacing surface which is compliant, soft feeling, and non-irritating to the wearer's skin. Further, the topsheet (40) may be less hydrophilic than the absorbent core (42), to present a relatively dry surface to the wearer, and is sufficiently porous to be liquid permeable, permitting liquid to readily penetrate through its thickness. A suitable topsheet (40) may be manufactured from a wide selection of web materials, such as porous foams, reticulated foams, apertured plastic films, natural fibers (for example, polyester or polypropylene fibers), or a combination of natural and synthetic fibers. The topsheet (40) is suitably employed to help isolate the wearer's skin from liquids held in the absorbent core (42).

Various woven and nonwoven fabrics may be used for the topsheet (40). For example, the topsheet (40) may be composed of a meltblown or spunbonded web of

polyolefin fibers. The topsheet (40) may also be a bonded-carded web composed of natural and/or synthetic fibers. The topsheet (40) may be composed of a substantially hydrophobic material, and the hydrophobic material may, optionally, be treated with a surfactant, or otherwise processed, to impart a desired level of wettability and hydrophilicity. Specifically, the topsheet (40) may be a nonwoven, spunbond, polypropylene fabric composed of about 2.8 to about 3.2 denier fibers formed into a web having a basis weight of about 22 gsm and a density of about 0.06 g/cc.

The topsheet (40) may also be surface treated with about 0.3 weight percent of a surfactant mixture that contains a mixture of AHCOVEL Base N-62 surfactant and GLUCOPON 220UP surfactant in about a 3:1 ratio based on a total weight of the surfactant mixture. The AHCOVEL Base N-62 surfactant is purchased from Hodgson Textile Chemicals Inc., a business having offices in Mount Holly, North Carolina, and includes a blend of hydrogenated ethoxylated castor oil and sorbitan monooleate in a 55:45 weight ratio. The GLUCOPON 220UP surfactant is purchased from Henkel Corporation, Gulph Mills, Pennsylvania, and includes alkyl polyglycoside. The surfactant may also include additional ingredients such as aloe. The surfactant may be applied by any conventional means, such as spraying, printing, brush coating, foam or the like. The surfactant may be applied to the entire topsheet (40) or may be selectively applied to particular sections of the topsheet, such as the medial section along the longitudinal centerline of a diaper, to provide greater wettability of such sections.

The backsheet (38) may suitably be composed of a material which is either liquid permeable or liquid impermeable. It is generally desirable that the backsheet (38) be formed from a material which is substantially liquid impermeable. For example, a typical backsheet (38) can be manufactured from a thin plastic film or other flexible liquid impermeable material. Moreover, the backsheet (38) may be formed from a polyethylene film having a thickness of from about 0.012 mm (0.5 mil) to about 0.051 mm (2.0 mils). If desirous of presenting the backsheet (38) with a more cloth-like feel, the backsheet may include a polyethylene film having laminated to the lower or opposing surface thereof a nonwoven web, such as a spunbond web of polyolefin fibers. For example, a polyethylene film having a thickness of about 0.015 mm (0.6 mil) may have thermally laminated thereto a spunbond web of polyolefin fibers, which fibers have a thickness of about 1.5 to about 2.5 denier per filament, which nonwoven web has a basis weight of about 24 gsm (0.7 osy). Methods of forming such cloth-like outer covers are known to those skilled in the art.

Further, the backsheet (38) may be formed of a woven or nonwoven fibrous web layer which has been totally or partially constructed or treated to impart a desired level of liquid impermeability to selected regions that are adjacent or proximate the absorbent core (42). Still further, the backsheet (38) may optionally be composed of micro-porous

"breathable" material which permits vapors to escape from the absorbent core (42) while still preventing liquid exudates from passing through the backsheet.

The absorbent core (42) may include a matrix of hydrophilic fibers, such as a web of cellulosic fluff, mixed with particles of a high-absorbency material commonly known as superabsorbent material. In a particular version, the absorbent core (42) includes a mixture of superabsorbent hydrogel-forming particles and wood pulp fluff. The wood pulp fluff may be exchanged with synthetic polymeric, meltblown fibers or with a combination of meltblown fibers and natural fibers. The superabsorbent particles may be substantially homogeneously mixed with the hydrophilic fibers or may be non-uniformly mixed.

The absorbent core (42) may have any of a number of shapes. For example, the absorbent core (42) may be rectangular, I-shaped or T-shaped. It is often considered as desirable for the absorbent core (42) to be narrower in the crotch portion than the rear or front portion(s).

The high-absorbency material can be selected from natural, synthetic and modified natural polymers and materials. The high-absorbency materials can be inorganic materials, such as silica gels, or organic compounds, such as crosslinked polymers. The term "crosslinked" refers to any means for effectively rendering normally water-soluble materials substantially water insoluble, but swellable. Such means can include, for example, physical entanglement, crystalline domains, covalent bonds, ionic complexes and associations, hydrophilic associations, such as hydrogen bonding, and hydrophobic associations or Van der Waals forces.

Examples of synthetic, polymeric, high-absorbency materials include the alkali metal and ammonium salts of poly(acrylic acid) and poly(methacrylic acid), poly(acrylamides), poly(vinyl ethers), maleic anhydride copolymers with vinyl ethers and alpha-olefins, poly(vinyl pyrolidone), poly(vinyl morpholinone), poly(vinyl alcohol), and mixtures and copolymers thereof. Further polymers suitable for use in the absorbent core include natural and modified natural polymers, such as hydrolyzed acrylonitrile-grafted starch, acrylic acid grafted starch, methyl cellulose, carboxymethyl cellulose, hydroxypropyl cellulose, and the natural gums, such as alginates, xanthum gum, locust bean gum, and the like. Mixtures of natural and wholly or partially synthetic absorbent polymers can also be useful. Processes for preparing synthetic, absorbent gelling polymers are disclosed in U.S. Patent No. 4,076,663, issued to Masuda *et al.*, and U.S. Patent No. 4,286,082, issued to Tsubakimoto *et al.*

The high-absorbency material may be in a variety of geometric forms. It is desired that the high-absorbency material be in the form of discrete particles. However, the high-absorbency material may also be in the form of fibers, flakes, rods, spheres, needles, or the like. Often, the high-absorbency material is present in the absorbent core (42) in an amount of from about 5 to about 100 weight percent based on total weight of the absorbent core.

Referring now to FIGs. 3-6, in its unfolded condition a disposable absorbent article, in this instance a diaper (30), has an initial upper surface (70), an initial lower surface (72), a longitudinal centerline (74), a transverse centerline (76), opposing first longitudinal side edges (46), opposing first transverse end edges (48), opposing longitudinal terminal side edges (60), and opposing transverse terminal end edges (62).

The diaper (30) may be suitably folded by forming one fold extending in a transverse direction. The one fold is formed by bringing a portion of the initial upper surface (70) into facing relationship with another portion of the initial upper surface, an example of which is illustrated in FIG. 7. The one fold extends in a transverse direction and runs generally parallel to the transverse centerline (76) of the diaper (30). Moreover, the one fold extending in the transverse direction may be spaced substantially equally between the first transverse end edges (48) or unequally between the first transverse end edges. Typically, the initial upper surface (70) is the topsheet (40); however, one of skill in the art will readily appreciate that the initial upper surface may alternatively be the backsheet (38). The formation of the one fold extending in the transverse direction results in a partially-folded diaper (78). As illustrated in FIGs. 7-10, the partially-folded diaper (78) has an intermediate first surface (80), an intermediate second surface (82), opposing first longitudinal side edges (46) and opposing second transverse end edges (84). The partially-folded diaper (78) is thereafter further folded by forming a number, greater than one, of transversely extending folds in an accordion-like manner. The accordion-like folds extend in a transverse direction and run generally parallel to the transverse centerline (76) of the diaper (30). The transversely extending accordion-like folds are spaced between opposing second transverse end edges (84). The accordion-like folds extending in the transverse direction may be spaced substantially equally between the second transverse end edges (84) or unequally between the second transverse end edges. For clarification purposes, FIG. 11 illustrates an article having five accordion-like folds. The number of transversely extending accordion-like folds is typically greater than one. Desirably, the number of transversely extending accordion-like folds is an even number greater than one. Even more desirably, the number of transversely extending accordion-like folds is 2. As illustrated in FIGs. 12 and 13, the diaper (88) has a folded configuration (similar in shape to the letter "S" and thus also referred to herein as the "S" folded configuration), a first outer panel (90) and a second outer panel (92). Referring to FIGs. 13 and 14, each outer panel (90, 92) typically has a major surface (94), a minor surface (96), and a periphery (98). Desirably, the backsheet (38) comprises a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version. However, one of skill in the art will readily appreciate that the topsheet (40) may comprise a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version.

Another version of the present invention provides for a diaper (30) to be folded by forming at least one longitudinally extending fold in each of the side margins (64), an example of which is illustrated in FIG. 4. The longitudinally extending folds are usually formed by folding the first longitudinal side edges (46) inward toward the initial upper surface (70) and thus bringing at least a portion of the initial upper surface into facing relationship with another portion of the initial upper surface. Each longitudinally extending fold so formed is typically inboard of the original positioning of the respective first longitudinal side edge (46) and either on or outboard of the respective longitudinal terminal side edge (60) of the absorbent core (42). The diaper (30) is further folded by forming one fold extending in a transverse direction. The one fold is formed by bringing a portion of the initial upper surface (70) into facing relationship with another portion of the initial upper surface, an example of which is illustrated in FIG. 7. The one fold extends in a transverse direction and runs generally parallel to the transverse centerline (76) of the diaper (30). Moreover, the one fold extending in the transverse direction may be spaced substantially equally between the first transverse end edges (48) or unequally between the first transverse end edges. Typically, the initial surface (70) is the topsheet (40); however, one of skill in the art will readily appreciate that the initial upper surface may alternatively be the backsheet (38). The formation of the one fold extending in the transverse direction results in a partially-folded diaper (78). As illustrated in FIGs. 7-10, the partially-folded diaper (78) has an intermediate first surface (80), an intermediate second surface (82), opposing second longitudinal side edges (47) and opposing second transverse end edges (84). The partially-folded diaper (78) is thereafter further folded by forming a number, greater than one, of transversely extending folds in an accordion-like manner. The accordion-like folds extend in a transverse direction and run generally parallel to the transverse centerline (76) of the diaper (30). The transversely extending accordion-like folds are spaced between opposing second transverse end edges (84). Moreover, the accordion-like folds extending in the transverse direction may be spaced substantially equally between the second transverse end edges (84) or unequally between the second transverse end edges. For clarification purposes, FIG. 11 illustrates an article having five accordion-like folds. The number of transversely extending accordion-like folds is typically greater than one. Desirably, the number of transversely extending accordion-like folds is an even number greater than one. Even more desirably, the number of transversely extending accordion-like folds is 2. As illustrated in FIGs. 12 and 13, the diaper (88) has a folded configuration (similar in shape to the letter "S" and thus also referred to herein as the "S" folded configuration), a first outer panel (90) and a second outer panel (92). Referring to FIGs. 13 and 14, each outer panel (90, 92) typically has a major surface (94), a minor surface (96), and a periphery (98). Desirably, the backsheet (38) comprises a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded

according to this version. However, one of skill in the art will readily appreciate that the topsheet (40) may comprise a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version.

Still another version of the present invention provides for a diaper (30) to be folded by forming a number of transversely extending folds in an accordion-like manner. For clarification purposes, FIG. 15 illustrates a disposable absorbent article having a number of folds in an accordion-like manner. The number of transversely extending accordion-like folds is typically greater than two. Desirably, the number of transversely extending accordion-like folds is an odd number greater than four. Alternatively, the number of transversely extending accordion-like folds is five. The transversely extending accordion-like folds run in a direction generally parallel to the transverse centerline (76) of the diaper (30). Moreover, the transversely extending folds may be spaced substantially equally between the opposing first transverse end edges (48) or unequally between the transverse end edges. As illustrated in FIGs. 16 and 17, the folded diaper has a first outer panel (90) and a second outer panel (92). Referring to FIGs. 14 and 17, each outer panel (90, 92) typically has a major surface (94), a minor surface (96) and a periphery (98). Desirably, the backsheet (38) comprises a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version. However, one of skill in the art will readily appreciate that the topsheet (40) may comprise a substantial portion of the major surface (94) of each outer panel (90, 94) of the disposable absorbent article folded according to this version.

In yet another version of the present invention, a diaper (30) is folded by forming at least one longitudinally extending fold in each of the side margins (64), an example of which is illustrated in FIG. 4. The longitudinally extending folds are usually formed by folding the first longitudinal side edges (46) inward toward the initial upper surface (70) and thus bringing at least a portion of the initial upper surface into facing relationship with another portion of the initial upper surface. Each longitudinally extending fold so formed is typically inboard of the original positioning of the respective first longitudinal side edge (46) and either on or outboard of the respective longitudinal terminal side edge (60) of the absorbent core (42). Typically, the initial surface (70) is the topsheet (40); however, one of skill in the art will readily appreciate that the initial upper surface may alternatively be the backsheet (38). The diaper (30) is further folded by forming a number of transversely extending folds in an accordion-like manner. For clarification purposes, FIG. 15 illustrates a disposable absorbent article having a number of folds in an accordion-like manner. The number of transversely extending accordion-like folds is typically greater than two. Desirably, the number of transversely extending accordion-like folds is an odd number greater than four. Alternatively, the number of transversely extending accordion-like folds is five. The transversely extending

accordion-like folds run in a direction generally parallel to the transverse centerline (76) of the diaper (30). Moreover, the transversely extending accordion-like folds may be spaced substantially equally between the opposing first transverse end edges (48) or unequally between the transverse end edges. As illustrated in FIGs. 16 and 17, the folded diaper has a first outer panel (90) and a second outer panel (92). Referring to FIGs. 14 and 17, each outer panel (90, 92) typically has a major surface (94), a minor surface (96) and a periphery (98). Desirably, the backsheet (38) comprises a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version. However, one of skill in the art will readily appreciate that the topsheet (40) may comprise a substantial portion of the major surface (94) of each outer panel (90, 92) of the disposable absorbent article folded according to this version.

The term "inboard" is intended to refer to the direction from a periphery or an edge toward a respective centerline. The term "outboard" is intended to refer to a direction away from a respective centerline.

The disposable absorbent articles folded according to the present invention will desirably have a relatively compact configuration. Specifically, the area or footprint of a folded disposable absorbent article is compared to the area or footprint of the unfolded disposable absorbent in its flat-out, uncontracted state (*i.e.*, with all elastic induced gathering and contraction removed). The method of comparing the folded footprint to the unfolded footprint is described in the Examples that follow. Table 1 summarizes the results obtained from this comparison. Desirably, the ratio between the folded configuration and the unfolded configuration is no more than 0.15; alternatively, no more than 0.14; alternatively, no more than 0.13; alternatively, no more than 0.12; alternatively, no more than 0.11; alternatively, no more than 0.10; alternatively, no more than 0.09; alternatively, no more than 0.08; alternatively, no more than 0.07; alternatively, no more than 0.06; and finally, alternatively, no more than 0.05. Desirably, the ratio between the folded configuration and the unfolded configuration is no less than 0.04; alternatively, no less than 0.05; alternatively, no less than 0.06; alternatively, no less than 0.07; alternatively, no less than 0.08; alternatively, no less than 0.09; alternatively, no less than 0.10; alternatively, no less than 0.11; alternatively, no less than 0.12; alternatively, no less than 0.13; and finally, alternatively, no less than 0.14. Thus, the ratio between the folded and unfolded configuration of a disposable absorbent article typically is no less than 0.04 and no more than 0.15; although the approximate ratio may vary according to, *inter alia*, the general design and intended use of the disposable absorbent article.

Disposable absorbent articles folded according to any of the methods of the present invention are relatively compact. Consequently, these compact folded articles are well suited

for incorporation into a variety of packaging, including compact packaging that is suitable for use by consumers in purses, backpacks, briefcases and other similar containers until needed.

EXAMPLES

The following Examples describe various versions of the invention. Other versions within the scope of the claims herein will be apparent to one skilled in the art from consideration of the specification or practice of the invention as disclosed herein. It is intended that the specification, together with the Examples, be considered exemplary only, with the scope and spirit of the invention being indicated by the claims which follow the Examples.

Example 1

A diaper (HUGGIES® ULTRATRIM® Step 3 diaper, available from Kimberly-Clark Corporation, Neenah, Wisconsin) was produced which is similar to the disposable absorbent articles described in detail herein. The diaper was configured to fit an infant weighing about 16 to about 28 pounds. The diaper was folded by hand as illustrated in FIG. 12 and described previously in detail herein, in the "S" fold configuration, and positioned in a cavity formed from a material, namely, 611K--3 mil nylon with LLDPE coextrusion, available from Curwood, New London, Wisconsin, having at least one layer of a substantially low gas permeability or one layer of a substantially gas impermeable material, which was formed and positioned in a horizontal form/fill/seal packaging machine, in this instance, a RapidPak RP-55, manufactured by Alkar-Rapidpak, Inc., Lodi, Wisconsin. The top material, that is, the sealing cover, also having at least one substantially gas impermeable layer, was a 48 gauge polyester film with 2 mils HDPE peel seal (coextrusion), available from Curwood, New London, Wisconsin. The top material was provided as a "peel back" material for a caregiver's convenience, and it was thermally sealed over the cavity while the cavity with the folded diaper therein was positioned in the vacuum chamber and a vacuum pressure in a range of about 20 to about 25 inches of Mercury relative to the existing atmospheric pressure was removed from the chamber. The chamber was then returned to existing atmospheric pressure, which resulted in compression of the package and the folded absorbent article therein. The packaged article was then removed from the chamber.

The dimensions of the S-folded diaper in its package were then compared to the unfolded dimensions of the Step 3 diaper disclosed in Example 4, which was measured as described in detail in Example 1A. The dimensions of the S-folded diaper in its package were then measured. The width was 4.250 inches and the length was 2.500 inches. The area of the perimeter or "footprint" was 10.625 inches^2. The depth was 0.750 inches. The volume was 7.969 inches^3. The ratio of the footprint of the S folded vacuum packaged diaper

compared to its unfolded footprint was 0.06. The measurement did not include any portion of the package which extended beyond the perimeter of the diaper, but only the diaper contained within. As compared to the S folded but un-packaged diaper of Example 4B, the present vacuum packaging diaper only had about 78 percent of the area of the unpackaged S folded diaper of Example 4B (an about 22 percent reduction in area), and only had about 55 percent of the volume of the unpackaged S folded diaper of Example 4B (an about 45 percent reduction in volume).

TABLE 1. Diaper Dimensions

HUGGIES® ULTRATRIM® PREEMIE	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				99.59		
Bifold (Example 1A)	3.750	5.750	0.329	21.56	7.094	0.217
S-Fold (Example 1B)	3.750	2.000	0.988	7.50	7.410	0.075

*Folded to Unfolded Area

HUGGIES® ULTRATRIM® STEP 1	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				128.61		
Bifold (Example 2A)	4.000	6.625	0.343	26.50	9.100	0.206
S-Fold (Example 2B)	4.000	2.500	1.028	10.00	10.280	0.078

*Folded to Unfolded Area

HUGGIES® ULTRATRIM® STEP 2	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				153.36		
Bifold (Example 3A)	4.125	7.500	0.350	30.94	10.828	0.202
S-Fold (Example 3B)	4.125	2.750	1.050	11.34	11.910	0.074

*Folded to Unfolded Area

HUGGIES® ULTRATRIM® STEP 3	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				172.6		
Bifold (Example 4A)	4.500	8.250	0.354	37.13	13.142	0.215
S-Fold (Example 4B)	4.500	3.000	1.063	13.50	14.351	0.078

*Folded to Unfolded Area

HUGGIES® ULTRATRIM® STEP 4	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				208.41		
Bifold (Example 5A)	4.0625	9.375	0.375	38.09	14.282	0.183
S-Fold (Example 5B)	4.0625	3.375	1.125	13.71	14.425	0.066

*Folded to Unfolded Area

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HUGGIES® ULTRATRIM® STEP 5	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				231.59		
Bifold (Example 6A)	4.375	9.625	0.383	42.11	16.128	0.182
S-Fold (Example 6B)	4.375	3.250	1.150	14.22	16.352	0.061

*Folded to Unfolded Area

HUGGIES® ULTRATRIM® STEP 6	Dimensions (in.)			Area ($in.^2$)	Volume ($in.^3$)	Ratio*
	Width	Length	Depth			
Flat/Unfolded				265.52		
Bifold (Example 7A)	4.500	10.375	0.399	46.69	18.628	0.176
S-Fold (Example 7B)	4.500	3.750	1.197	16.88	20.199	0.064

*Folded to Unfolded Area

Example 1A

A diaper (HUGGIES® ULTRATRIM® diaper, available from Kimberly-Clark Corporation, Neenah, WI) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "preemie" size, configured to fit a premature infant. The diaper was positioned in its unfolded configuration, *i.e.*, it's laid flat with unretracted elastics and extended to ungathered length configuration, and, as disclosed in Table 1, the diaper was measured to have an area or "footprint" of 99.59 inches^2. The area was determined as described below.

A rectangular sheet of translucent paper large enough to cover the absorbent article was obtained and utilized. The length and width of the sheet was measured to the nearest 0.01 inch. The paper was then weighed to the nearest 0.001 gram. The weight measurement was divided by the area measurement to determine the basis weight of the paper. The article, in this instance, the diaper, was opened completely, including any fasteners, and positioned in the laid flat configuration described above, on a planar surface. The article was taped to the surface using masking tape. For other disposable absorbent articles, such as training pants and adult incontinence pants, the articles were cut on each side between the leg openings and the waist opening prior to being positioned and taped to the planar surface. The sheet was positioned over and upon the disposable absorbent article, and a tracing of the outer perimeter, including fasteners, was made on the sheet. The paper was then cut along the traced line and weighed. The weight of the paper was multiplied by the inverse of the basis weight obtained previously. The result was an estimate of the total square inches of the absorbent article, which was reported to the nearest 0.01 in^2.

The diaper was then folded into the bifolded configuration illustrated in FIG. 7 by hand. The dimensions of the bifolded diaper were then measured. That is, the diaper was positioned on a planar surface and restrained by hand, if necessary, in the folded position, while the length measurement 138 and the width measurement 140 were obtained and recorded.

The depth measurement 142 was obtained by measuring a standard packaged bag of articles, that is, in this instance, a bag containing bifolded diapers. The height of the bag was divided by the total number of panels (for example, in a bag of 24 bifolded diapers, there are 48 panels; diapers in the bag were packaged in the bag horizontally relative to the top height of the bag). These numbers were recorded. All measurements relating to diapers are in Tables 1 and 4.

As disclosed in Table 1, the width was 3.750 inches and the length was 5.750 inches. The area or "footprint" was 21.56 inches^2. The calculated depth was 0.329

inches^2. The volume was 7.094 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.217.

Example 1B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "preemie" size, configured for a premature infant. The diaper was positioned in its completely unfolded configuration, and as disclosed in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 99.59 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 3.75 inches and the length was 2.000 inches. The area or "footprint" was 7.50 inches^2. The calculated depth was 0.988 inches. The volume was 7.410 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.075.

Example 2A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 1" size, configured to fit an infant having a weight of about 8 to about 14 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 128.61 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.000 inches and the length was 6.625 inches. The area or "footprint" was 26.50 inches^2. The calculated depth was 0.343 inches. The volume was 9.100 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.206.

Example 2B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 1" size, configured to fit an infant having a weight of about 8 to about 14 pounds. The diaper was positioned in its completely unfolded configuration, described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 128.61 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.000 inches and the length was 2.500 inches. The area or "footprint" was 10.000 inches^2. The calculated depth was 1.028 inches. The volume was 10.280 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.078.

Example 3A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 2" size, configured to fit an infant having a weight of about 12 to about 18 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 153.36 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.125 inches and the length was 7.500 inches. The area or "footprint" was 30.94 inches^2. The calculated depth was 0.350 inches. The volume was 10.828 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.202.

Example 3B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 2" size, configured to fit an infant having a weight of about 12 to about 18 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 153.36 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.125 inches and the length was 2.750 inches. The area or "footprint" was 11.34 inches^2. The calculated depth was 1.050 inches. The volume was 11.910 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.074.

Example 4A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 3" size, configured to fit an infant having a weight of about 16 to about 28 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of

172.6 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.500 inches and the length was 8.250 inches. The area or "footprint" was 37.13 inches^2. The calculated depth was 0.354 inches. The volume was 13.142 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.215.

Example 4B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 3" size, configured to fit an infant having a weight of about 16 to about 28 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 172.6 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.500 inches and the length was 3.000 inches. The area or "footprint" was 13.50 inches^2. The calculated depth was 1.063 inches. The volume was 14.351 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.078.

Example 5A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 4" size, configured to fit an infant having a weight of about 22 to about 37 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 208.41 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.0625 inches and the length was 9.375 inches. The area or "footprint" was 38.09 inches^2. The calculated depth was 0.375 inches. The volume was 14.282 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.183.

Example 5B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 4" size, configured to fit an infant having a weight of about 22 to about 37 pounds. The diaper was

positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 208.41 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.0625 inches and the length was 3.375 inches. The area or "footprint" was 13.71 inches^2. The calculated depth was 1.125 inches. The volume was 14.425 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.066.

Example 6A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 5" size, configured to fit an infant having a weight of over 27 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 231.59 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.375 inches and the length was 9.625 inches. The area or "footprint" was 42.11 inches^2. The calculated depth was 0.383 inches. The volume was 16.128 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.182.

Example 6B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 5" size, configured to fit an infant having a weight of over 27 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 231.59 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.375 inches and the length was 3.250 inches. The area of the perimeter or "footprint" was 14.22 inches^2. The calculated depth was 1.150 inches. The volume was 16.352 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.061.

Example 7A

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 6" size, configured to fit an infant having a weight of over 35 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 265.52 inches^2. The diaper was folded into the bifolded configuration illustrated in FIG. 7 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.500 inches and the length was 10.375 inches. The area or "footprint" was 46.69 inches^2. The calculated depth was 0.399 inches. The volume was 18.628 inches^3. The ratio of the footprint of the bifolded diaper compared to its unfolded footprint was 0.176.

Example 7B

A diaper (HUGGIES® ULTRATRIM®) which is similar to the disposable absorbent article described herein was utilized in this Example. The diaper was a "Step 6" size, configured to fit an infant having a weight of over 35 pounds. The diaper was positioned in its completely unfolded configuration, as described in Example 1A. As disclosed in Table 1, the diaper was measured to have an area or "footprint" of 265.52 inches^2. The diaper was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and it was measured in the same manner as described in Example 1A.

As disclosed in Table 1, the width was 4.500 inches and the length was 3.750 inches. The area or "footprint" was 16.88 inches^2. The calculated depth was 1.197 inches. The volume was 20.199 inches^3. The ratio of the footprint of the "S" folded diaper compared to its unfolded footprint was 0.064.

TABLE 2. Training Pant Dimensions

HUGGIES® PULL-UPS® Training Pants (large size)	**Dimensions (in.)**			**Area (in.^{2})**	**Volume (in.^{3})**	**Ratio***
	Width	**Length**	**Depth**			
Flat/Unfolded				182.375		
Bifold (Example 8A)	4.375	10.100	0.532	44.19	23.508	0.242
S-Fold (Example 8B)	4.375	3.250	1.595	14.22	22.679	0.078

*Folded to Unfolded Area

Example 8A

A training pant (HUGGIES® PULL-UPS®, available from Kimberly-Clark Corporation, Neenah, WI), which was similar to the disposable absorbent articles described herein, was utilized in this Example, except that it is an underwear-type of garment for a young child. The training pant was a "large" size. The training pant was positioned in its unfolded configuration. That is, the training pant was cut on each side from leg opening to waist opening, and laid flat with unretracted elastics and extended to ungathered length configuration, and measured as described previously in detail in Example 1A. As disclosed in Table 2, the training pant was measured to have an area or "footprint" of 182.375 inches^2. The area was determined as described previously in Example 1A

An identical uncut training pant, which in its configuration as underwear has a pre-existing bifold (front and back panel seamed on each side) configuration was measured. That is the training pant was positioned on a planar surface and restrained by hand, if necessary, in the position, while the length measurement 138 and the width measurement 140 were obtained and recorded.

The depth measurement 142 was obtained by measuring a standard packaged bag of articles, that is, in this instance, a bag containing training pants. The height of the bag was divided by the total number of panels in a manner substantially similar that that described previously in Example 1A for diapers (training pants in the bag were packaged in the bag horizontally relative to the top height of the bag). These numbers were recorded. All measurements relating to training pants are in Tables 2 and 4.

As disclosed in Table 2, the width was 4.375 inches and the length was 10.100 inches. The area or "footprint" was 44.19 inches^2. The calculated depth was 0.532 inches. The volume was 23.508 inches^3. The ratio of the footprint of the folded training pant compared to its unfolded footprint was 0.242.

Example 8B

A training pant diaper (HUGGIES® PULL-UPS® "large" size available from Kimberly-Clark Corporation, Neenah, WI), which was similar to the disposable absorbent articles described herein, was utilized in this Example, except that the article is an underwear-type garment for a young child. The training pant was positioned in its cut-open laid flat configuration, as described in Example 1A. As disclosed in Table 2, the training pant was measured to have an area or "footprint" of 182.375 inches^2. The training pant was folded into the "S" configuration illustrated in FIG. 12 by hand, and was measured in the same manner as described in Example 1A.

As disclosed in Table 2, the width was 4.375 inches and the length was 3.250 inches. The area or "footprint" was 14.22 inches^2. The calculated depth was 1.595

inches. The volume was 22.679 inches^3. The ratio of the footprint of the folded training pant compared to its unfolded footprint was 0.078.

TABLE 3. Adult Incontinence Pant Dimensions

DEPEND® Refastenable Under Wear (large size)	Dimensions (in.)			Area (in.^{2})	Volume (in.^{3})	Ratio*
	Width	Length	Depth			
Flat/Unfolded				562.08		
Bifold (Example 9A)	7.125	15.125	0.499	107.77	53.775	0.192
S-Fold (Example 9D)	7.125	5.275	1.497	37.58	56.264	0.068

*Folded to Unfolded Area

TABLE 4. Depth Measurement of Panel(s) of Product

Product	Mechanical Compression[1,2,3]
HUGGIES® ULTRATRIM® Preemie	0.1656
HUGGIES® ULTRATRIM® Step 1	0.1714
HUGGIES® ULTRATRIM® Step 2	0.1750
HUGGIES® ULTRATRIM® Step 3	0.1771
HUGGIES® ULTRATRIM® Step 4	0.1875
HUGGIES® ULTRATRIM® Step 5	0.1917
HUGGIES® ULTRATRIM® Step 6	0.1955
HUGGIES® PULL-UPS® Training Pants (large size)	0.2658
DEPEND® Refastenable Under Wear (large size)	0.2495

1. This panel dimension was determined by measuring a standard bag of diapers HUGGIES® ULTRATRIM® diapers containing bifolded diapers and dividing the height of the bag by the total number of panels (diapers positioned horizontally relative to the top height of the bag). Using this average per panel thickness, the thickness of several fold configurations were calculated by multiplying the average per panel thickness by the number of panels in the given fold configuration.

2. This panel dimension was determined by measuring a standard bag of HUGGIES® PULL-UPS® training pants containing bifolded constructed pants and dividing the height of the bag by the total number of panels (training pants positioned horizontally relative to the top height of the bag). Using this average per panel thickness, the thickness of several fold configurations were calculated by multiplying the average per panel thickness by the number of panels in the given fold configuration.

3. This panel dimension was determine by measuring a standard bag of DEPEND® Refastenable Under Wear containing bifolded constructed garments and dividing the height of the bag by the total number of panels (garments positioned horizontally relative to the top height of the bag). Using this average per panel thickness, the thickness of several fold configurations were calculated by multiplying the average per panel thickness by the number of panels in the given fold configuration.

Example 9A

An adult incontinence garment "pant" (DEPEND® Refastenable Disposable Underwear, size "large", available from Kimberly-Clark Corporation, Neenah, WI), which was similar to the disposable absorbent articles described herein, was utilized in this Example, except that it is an underwear-type of garment for an adult. The garment was positioned in its unfolded configuration. That is, the underwear garment was cut on each side from leg opening to waist opening, and laid flat with unretracted elastics and extended to ungathered length configuration, and measured as described previously in detail in Example 1A. As disclosed in Table 3, the garment was measured to have an area or "footprint" of 562.08 inches^2. The area was determined as described previously in Example 1A.

An identical uncut garment, which in its configuration as underwear has a pre-existing bifold (front and back panel formed on each anterior and posterior side) configuration was measured. That is the garment was positioned on a planar surface and restrained by hand, if necessary, in the position, while the length measurement 138 and the width measurement 140 were obtained and recorded. The depth measurement 142 was obtained by measuring a standard packaged bag of articles, that is, in this instance, a bag containing the adult garment described herein. The height of the bag was divided by the total number of panels in a manner substantially similar that that described previously in Example 1A for diapers (the garments in the bag were packaged in the bag horizontally relative to the top height of the bag). These numbers were recorded. All measurements relating to the adult garment are in Tables 3 and 4.

As disclosed in Table 3, the width was 7.125 inches and the length was 15.125 inches. The area or "footprint" was 107.77 inches^2. The calculated depth was 0.499 inches. The volume was 53.775 inches^3. The ratio of the footprint of the bifolded garment compared to its unfolded footprint was 0.192.

Example 9B

An adult incontinence garment "pant" (DEPEND® Refastenable Disposable Underwear, size "large", available from Kimberly-Clark Corporation, Neenah, WI), which was similar to the disposable absorbent articles described herein, was utilized in this Example, except that it is an underwear-type of garment for an adult. The garment was positioned in its cut-open laid flat configuration, as described in Example 1A. As disclosed in Table 3, the garment was measured to have an area or "footprint" of 562.08 inches^2. The garment was folded into the "S" folded configuration illustrated in FIG. 12 by hand, and was measured in the same manner as described in Example 1A.

As disclosed in Table 3, the width was 7.125 inches and the length was 5.275 inches. The area or "footprint" was 38.30 inches^2. The calculated depth was 1.497 inches. The volume was 56.264 inches^3. The ratio of the footprint of the "S" folded garment compared to its unfolded footprint was 0.068.

Having described the invention in rather full detail, it will be readily apparent that various changes and modifications can be made without departing from the spirit of the invention. All of such changes and modifications are contemplated as being within the scope of the invention as defined by the appended claims and any equivalents thereto.